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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/489,356	01/21/00	SHIH H	AM-1622.D1

IM61/0511

Patent Counsel
Applied Materials Inc.
P.O. Box 450A
Santa Clara CA 95052

EXAMINER	
ZERVIGON,R	
ART UNIT	**PAPER NUMBER**
1763	7

DATE MAILED: 05/11/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.	Applicant(s)
09/489,356	Shih, et al
Examiner	**Art Unit**
Rudy Zervigon	1763

-- Th MAILING DATE of this communication app ars on the cover sh t with th correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on Feb 28, 2001

2a) ☒ This action is **FINAL.** 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-6 and 8-23 is/are pending in the applica

4a) Of the above, claim(s) _____ is/are withdrawn from considera

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1-6 and 8-23 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirem

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☐ Notice of References Cited (PTO-892)

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 4, 5

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

19) ☐ Notice of Informal Patent Application (PTO-152)

20) ☐ Other:

DETAILED ACTION

Election/Restriction

1. Applicant's election of claims 1-23 in Paper No. 6 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1-6, and 8-22 are rejected under 35 U.S.C. 103(a) as being unpatentable J. Linke et al in view of Howard Mizuhara et al , Srihari Ponnekanti et al, Theodore J. Reinhart, Bruce H. Raeder et al, and Colin J. Smithells. Linke et al reports the protection accorded to plasma facing surfaces of plasma confining chambers by applying CVD Boron-doped graphite layers to such surfaces ("Materials and Characterization", paragraphs 3-5; "Erosion Behavior", entire section). Specifically, J. Linke et al teach:

i. A method of coating boron carbide, as B_4C grains between B_4C and $B_{13}C_3$, (CVD, "Materials and Characterization", paragraphs 3-5; "B/C ratios" - first sentence; "low-pressure plasma spray" - 6th paragraph, left column , page 228) on an aluminum-based member ("Materials and Characterization", paragraph 4; "stainless steel", "Inconel 600" each are aluminum alloys - see Colin J. Smithells for stainless steel compositions, Table 34)

ii. Forming a boron carbide layer carbide upon the surface (CVD, "Materials and Characterization", paragraphs 3-5)

iii. The boron carbide layer of 25wt% of carbon relative to boron as represented by B_4C

iv. no more than a native oxide of aluminum intervenes between the substrate and the boron carbide layer as inferred by the failure of J.Linke et al to mention any intervening layer

J. Linke et al does not specifically teach:

v. roughening a surface of a substrate to a value of surface finish Ra of at least 2.5μm, where said substrate is composed of an aluminum-based material selected from the group consisting of substancially pure aluminum and aluminum alloys including at least 90 wt% elemental aluminum

Howard Mizuhara et al teach:

vi. roughening a surface of a "substrate" comprising pure aluminum (Table 1, p. 503) including at least 90 wt% elemental aluminum ("UNS S41000", Table 1, p.503) to a roughness of at most 1.17μm (Table 3, page 507) to prepare such a surface for "a reliable joint between the ceramic and metal" (left column, last paragraph, p.505)

vii. A forming step comprising surface conversion, as defined by page 16 of the specification, such that a chemical reaction or "conversion" of the ceramic surface is achieved to deposit a sealing aid used form the metal/ceramic seal. This is described by Howard Mizuhara et al according to the "active brazing process" (right column, page 504). Specifically, Howard

Mizuhara et al teaches "wetting the ceramic material is accomplished by the chemical reaction of the active element with the ceramic" (right column, page 504).

Srihari Ponnekanti et al teach failure mechanisms of aluminum parts confined in plasma environments (section III.). Specifically, Srihari Ponnekanti et al teach

viii. no more than a native oxide of aluminum (Figure 1) intervenes over the "substrate"

ix. anodizing the "substrate" to form an anodization layer (Figure 1)

x. a material of said substrate is selected from the group consisting of aluminum and aluminum alloys (Figure 1)

xi. The method further comprising removing the anodization layer (top layer, Figure 3) from a second portion (right "crack", Figure 3) of the member (lower layer, Figure 1, 3) adjacent to said first portion (left "crack", Figure 3), the roughened (per Howard Mizuhara et al see below) first portion extending below (Figure 3) a portion of the anodization left by the removing step

Theodore J. Reinhart teaches the criticality of surface preparation for joints forming composite materials (P. 682, left column, second paragraph; first sentence; last two sentences; Bullets).

Bruce H. Raeder et al teaches the processing and tooling for the surface preparations of grinding and polishing (section - "Processing & Tooling" p. 464). Specifically, Bruce H. Raeder et al teaches the types and forms of surface morphologies (Figure 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to enhance the surface roughness of J.Linke et al's "substrate" surface of the aluminum-based member plasma facing surface as taught by Theodore J. Reinhart and Bruce H. Raeder et al. Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

xii. roughen a surface of a "substrate" comprising aluminum (Table 1, p. 503) to increase the roughness from the 1.17μm (Table 3, page 507), as taught by Mizuhara et al, to at least 2.5μm.

Motivation for enhancing the surface roughness of the J.Linke et al "substrate" surface of the aluminum-based member plasma facing surface as taught by Howard Mizuhara et al is in order to further enhance such a surface to "increase the surface energy of the surface to be bonded", additionally to "increase bond area and mechanical interlocking" as taught by Theodore J. Reinhart (P. 682, left column, second paragraph; first sentence; last two sentences; Bullets)

Additional motivation for combining the J. Linke et al and Howard Mizuhara et al teachings arise from the Srihari Ponnekanti et al discussion of the failure mechanisms of aluminum parts confined in plasma environments of semiconductor processing (Abstract, section III.)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to alter the composition of the B/C ratio as suggested by J.Linke et al such that optimal protection of the plasma facing material is achieved (CVD, "Materials and Characterization", paragraphs 3-5).

Motivation for altering the composition of the B/C ratio, as suggested by J.Linke et al, such that optimal protection of the plasma facing material is achieved is supported by case law optimization:

4.MPEP 2144.05

OPTIMIZATION WITHIN PRIOR ART CONDITIONS OR THROUGH ROUTINE EXPERIMENTATION

Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller , 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955) (Claimed process which was performed at a temperature between 40 _ C and 80 _ C and an acid concentration between 25 and 70% was held to be prima facie obvious over a reference process which differed from the claims only in that the reference process was performed at a temperature of 100 _ C and an acid concentration of 10%.). See also In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969) (Claimed elastomeric polyurethanes which fell within the broad scope of the references were held to be unpatentable

thereover because, among other reasons, there was no evidence of the criticality of the claimed ranges of molecular weight or molar proportions.). For more recent cases applying this principle, see Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989), and In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement Howard Mizuhara et al's active brazing process prior to the forming of the ceramic (boron carbide) layer as taught by J.Linke et al. Where the forming of the boron carbide layer comprises surface conversion of the ceramic such that a chemical reaction or "conversion" acts to deposit a sealing aid used form the metal/ceramic seal. This is described by Howard Mizuhara et al according to the "active brazing process" (right column, page 504). Specifically, Howard Mizuhara et al teaches "wetting the ceramic material is accomplished by the chemical reaction of the active element with the ceramic" (right column, page 504).

Motivation for implementing the Howard Mizuhara et al active brazing process prior to the forming of the ceramic (boron carbide) layer as taught by J.Linke et al, is discussed by Howard Mizuhara et al. Specifically, Howard Mizuhara et al describes how active brazing can provide "a reliable joint between the ceramic and metal" (left column, last paragraph, pp.505).

Response to Arguments

5. Applicant's arguments filed March 7, 2001 have been fully considered but they are not persuasive.

6. With respect to Linke not mentioning aluminum based substrates, applicant is directed to the following discussions by Linke:

xiii. A method of coating boron carbide, as B_4C grains between B_4C and $B_{13}C_3$, (CVD, "Materials and Characterization", paragraphs 3-5; "B/C ratios" - first sentence; "low-pressure plasma spray" - 6th paragraph, left column , page 228) on an aluminum-based member ("Materials and Characterization", paragraph 4; "stainless steel", "Inconel 600" each are aluminum alloys - see Colin J. Smithells for stainless steel compositions, Table 34)

7. With regards to the utility of the Howard Mizuhara et al reference in the stated rejections, it is emphasized that the Howard Mizuhara et al is strictly used to meet the deficiencies as posed by Linke et al.

Howard Mizuhara et al teach:

xiv. roughening a surface of a "substrate" comprising pure aluminum (Table 1, p. 503) including at least 90 wt% elemental aluminum ("UNS S41000", Table 1, p.503) to a roughness of at most 1.17μm (Table 3, page 507) to prepare such a surface for "a reliable joint between the ceramic and metal" (left column, last paragraph, p.505)

xv. A forming step comprising surface conversion, as defined by page 16 of the specification, such that a chemical reaction or "conversion" of the ceramic surface is achieved to deposit

a sealing aid used form the metal/ceramic seal. This is described by Howard Mizuhara et al according to the "active brazing process" (right column, page 504). Specifically, Howard Mizuhara et al teaches "wetting the ceramic material is accomplished by the chemical reaction of the active element with the ceramic" (right column, page 504).

8. With regards to the utility of the Reinhart and Raeder references in the stated rejections, it is emphasized that Reinhart and Raeder are strictly used to meet the deficiencies as posed by Linke et al.

Reinhart teaches:

Theodore J. Reinhart teaches the criticality of surface preparation for joints forming composite materials (P. 682, left column, second paragraph; first sentence; last two sentences; Bullets).

Bruce H. Raeder et al teaches the processing and tooling for the surface preparations of grinding and polishing (section - "Processing & Tooling" p. 464). Specifically, Bruce H. Raeder et al teaches the types and forms of surface morphologies (Figure 4).

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 305-3599. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (703) 308-1633.

GREGORY MILLS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700